Washington State
Department of Transportation

Memorandum

September 3, 2010

TO: Roger Kiers
MS: 47332

FROM: Steve Fuchs, P.E. SDF
Project Manager

SUBJECT: XL2760 Group 70
SR 162 Puyallup River Bridge – Bridge Replacement
MP 6.57 to MP 7.13
WIN: C16219A
Bridge Preservation Alternatives

Attached is the bridge preservation alternatives document for this project that was prepared to address the comments from the previous meeting with the ACOE and DAHP. I understand that you will forward this information to the consulting parties.

If you need any additional information, please contact me at (360) 570-6664 or Rafael Reyes at (360) 570-6666.

SDF

Attachment: Bridge Preservation Alternatives

cc: Jeff Sawyer
Project file

SR 162 Puyallup River Bridge Replacement
Bridge Preservation Alternatives Technical Memorandum
September 3, 2010

This memorandum supersedes an earlier version of this document dated April 27, 2009. This memo summarizes the alternatives we have considered for preservation of the historic McMillin Bridge over the Puyallup River on SR 162 at Milepost 6.81.

Background

The McMillin Bridge (162/006) was built in 1934-1935, and at the date of its completion, it was recognized as the longest reinforced concrete span exclusive of arches in the country. According to the designers, the bridge's "major features and layout were suggested" by Homer M. Hadley, who is recognized as one of Washington State's most innovative and important bridge engineers of the mid-twentieth century. For these reasons, the McMillin Bridge is on the National Register of Historic Places. This bridge was also recorded as part of the Historic American Engineering Record in 1993 (see attached sheets). This bridge is scheduled for replacement beginning the summer of 2011 because it is functionally obsolete, meaning that it doesn't meet current standards for vehicular traffic. Upstream of the existing bridge is an old steel truss railroad bridge that is currently being utilized by pedestrians/bikes as part of the Foothills Trail. The new replacement bridge will be constructed downstream of the existing McMillin Bridge (see vicinity map attached).

Alternatives for Preservation

Option 1. This option would leave the bridge in place as a 'monument' after traffic has been re-routed to the new bridge. The assumption is that pedestrian access would need to be maintained onto the bridge so that the public could enjoy the historical significance and uniqueness of the structure. This has the potential to create additional liability for the owner with regard to graffiti, kids jumping from or climbing on the bridge, and use by fishermen since this is 'hot spot' for the local anglers.

Option 2. This option would remove the bridge in its entirety in one piece and transport it to a new location. This presents a number of physical challenges. The existing superstructure weighs approximately 1100 tons, and to lift this bridge, it would take two of the largest cranes in the United States. However, there is not enough room between the old railroad bridge upstream and the McMillin Bridge for the cranes to stage and lift the bridge and swing it onto a transport vehicle. Another option would be to place a temporary bridge underneath the McMillin Bridge, jack the bridge up and roll it out of the way using Self Propelled Mobil Transport units (SPMT's) or some other transport vehicle. This has the additional challenges of having to completely close the road to all traffic from the bridge site to its eventual destination along with coordinating temporary relocation of overhead utilities. Lastly, due to its deteriorated state, there is some question as to whether the bridge could survive the move. This option, while technically it may be feasible, is not a practical option.

On Wednesday, April 15, 2009, I was invited to the Steering Committee meeting for the Bridge for Kids project. The purpose of this project is to construct an evacuation route from the three schools in Orting to cross the Carbon River to a safe gathering place 150 feet above the valley floor in the event of a lahar from Mt. Rainier. I presented the idea of salvaging the McMillin Bridge to see if the Steering Committee had any ideas of how they could possibly use this bridge on their project. The committee was receptive of the idea and thought that it might be a possibility for a crossing of SR 162 from the Middle School. The committee asked me to go back and find out the condition of the McMillin Bridge and to see if there were any fatal flaws in this concept. I met with Ron Lewis on April 20, 2009, and we looked at the Bridge Condition Report as well as the Bridge Inspection Report dated 5/15/2007 (both attached). What we found is that the bridge is 'structurally deficient' and has some significant deterioration. This means that the bridge would need to have some extensive repairs to bring it up to an acceptable condition, if it could survive the journey from the river to the city of Orting. Because of the type of bridge (truss), this bridge would have to be supported with temporary shoring underneath its entire length while the repairs are being made. It is expected that the repair of this bridge would cost substantially more than building a new pedestrian bridge over SR 162 for the kids. Ron Lewis stated that there have been several pedestrian bridges constructed in the past few years and that $2 million is an approximate construction cost.

Option 3. This option proposes to build a parallel bridge alongside, and rehabilitate the McMillin Bridge to continue to allow vehicular traffic. This would form a couplet, with northbound traffic on the new bridge and southbound on the McMillin Bridge. This option presents an operational challenge in that it would create a divided section on a non-divided highway. To rehabilitate the McMillin Bridge for long-term vehicular traffic creates design, environmental, and monetary challenges. The bridge has numerous cracks and spalls throughout the superstructure, most notably in the truss diagonals, which are primarily tension members. Rehabilitation would include removing and rebuilding the diagonals, replacement of the timber sidewalks, epoxy injection of cracks, and patching other spalled areas. In order to accomplish this work, the bridge would need to be supported by falsework along its entire length. The estimated cost for this work is $1.5 million. This rehabilitation would repair the existing damage, but the bridge would not meet current load capacity standards. Once the rehabilitation was completed, you are still left with a bridge that is over 75 years old that has experienced fatigue from earthquakes, floods, traffic, and collisions.

The next issue to address would be the substructure. Subsurface investigations for the new bridge indicate that existing soils are susceptible to liquefaction and lateral spread during a design seismic event. To retrofit the substructure of the McMillin Bridge would likely involve installing shafts on either side of both abutments to a depth of 120-130 ft and connecting them to a strengthened abutment. This would require the new bridge to be located farther downstream to make room for these new shafts. This would require more right of way, and would significantly increase the environmental impacts for the project because these new shafts would be considered "in-water" work and would likely require cofferdams. Estimated cost for this work would be $1.2 -$1.5 million and the work would be rather difficult due to the need to drill immediately adjacent to the existing foundation. The total cost for this rehabilitation would be approximately $2.7- $3.0 million. As a comparison, the new bridge construction cost is estimated at $2.6 million. With this alternative, the question was raised of whether the new bridge could be

reduced in width to a single lane if the existing bridge was rehabilitated and used for one-way traffic to form a couplet. Yes, you could reduce the bridge width from 40 ft. to 25 ft., which is the minimum width for a single lane. This would save approximately $200,000.

Option 4. This option is to rehabilitate the McMillin Bridge for pedestrian and bicycle traffic to allow the Foothills Trail to be re-routed onto the McMillin Bridge. This would necessitate Pierce County Parks and Recreation to take over ownership and maintenance responsibility of the McMillin Bridge. Pierce County Parks and Recreation staff have evaluated this option and have determined that they are not interested in this bridge for several reasons. However, WSDOT has not yet received an official letter from Pierce County stating their position. If the county did decide they want this bridge, there would be much discussion among the parties in determining the level of rehabilitation to be done and the associated cost. The options range from do nothing up to the complete rehabilitation mentioned above in Option 3. If nothing is done to the bridge, concrete will continue to spall off as the rebar continues to rust, and eventually the bridge will collapse into the river. Another option would be a cosmetic rehabilitation to patch spalls, epoxy inject cracks, and replace the timber sidewalks. This could probably be accomplished for $100,000 to $200,000 and would probably give the bridge 10 to 15 years before more rehabilitation would be necessary.

Option 5. This option is demolition of the bridge in place with the idea that preservation of the heritage of the bridge will be defined through the Section 106 process. This would require some temporary supports underneath the bridge and other protection measures to keep debris from entering the river. The estimated cost for demolition is $500,000.

Option 6. This option would retrofit the existing bridge to add more roadway width such that the bridge was no longer functionally obsolete. The assumption is that you would support the bridge with temporary supports, cut the bridge in half down the centerline of the road, move half the bridge sideways to make room for more roadway width. Although this option may seem feasible to a non engineer, the facts are that the existing truss design is based upon the combination of dead load and live loads for a 22 ft. roadway. If you add more roadway (dead load) to this bridge, you would have to strengthen the trusses by making them larger, which also adds additional dead load. Also, the additional width would likely require the introduction of lateral bracing, of which the current truss design does not have. This option has several technical problems in that concrete trusses are heavy and that when you attempt to strengthen them, you add substantial dead load, thus you end up with multiple design iterations where you have to continue increasing the size of the truss to counteract the additional weight from the concrete. In addition you would need to modify the foundations. Since this option's goal is to preserve the existing bridge due to its uniqueness, you quickly end up with a retrofitted bridge that doesn't look anything like the original. Typically with most truss bridges, it is cost prohibitive to retrofit the existing bridge because the expense usually equals or exceeds the cost of a new bridge and you are still left with an old bridge that doesn't meet current standards. This option is not feasible in that you would not be able to preserve the uniqueness of the Pratt Truss design.

Considerations

Any option that is considered that leaves the McMillin Bridge in place will have some major consequences to the current design including environmental considerations, cost implications, and schedule impacts. The current design removes the existing approach fills and utilizes that area for stormwater treatment such that no stormwater runoff enters the Puyallup River. Currently stormwater runoff leaves the McMillin Bridge via bridge drains that drop straight into the Puyallup River. If we were to continue to allow vehicle traffic on this bridge, we would be required to plug the existing bridge drains and find a way to treat the stormwater runoff from the existing bridge as well as the existing roadway. This option would eliminate the planned location for stormwater treatment and would require additional right of way for stormwater treatment. If we were unable to keep all of the stormwater runoff out of the Puyallup River, the Biological Assessment would need to be rewritten to include a stormwater discharge to the Puyallup River. This would have a significant impact to the project schedule. Also, if an option is chosen that removes vehicular traffic, the bridge could become an attractive nuisance, exposing the owner to increased liability.

Any option that allows the existing bridge to remain in place creates difficulties in obtaining permits for the project. Pierce County has jurisdiction over the floodplain and they require all projects within the critical area to have a 'zero rise' impact on the floodplain. The current design demonstrates a 'zero rise' in the floodplain because all of the existing large rip rap at the south abutment will be removed and this volume is greater than the amount of new fill being placed in the floodplain. Without removing the existing rip rap, it would be difficult for the project to demonstrate a 'zero-rise' in the floodplain. The US Fish & Wildlife Service, National Marine Fisheries Service, Washington State Fish & Wildlife, and the Puyallup Tribe Fisheries Dept. have all expressed a strong desire for the existing bridge to be removed primarily because the bridge abutments create a constriction for the river which increases the speed of river, increasing erosion, and constricting the floodplain.

Cc: S. Roark
T. Cowan